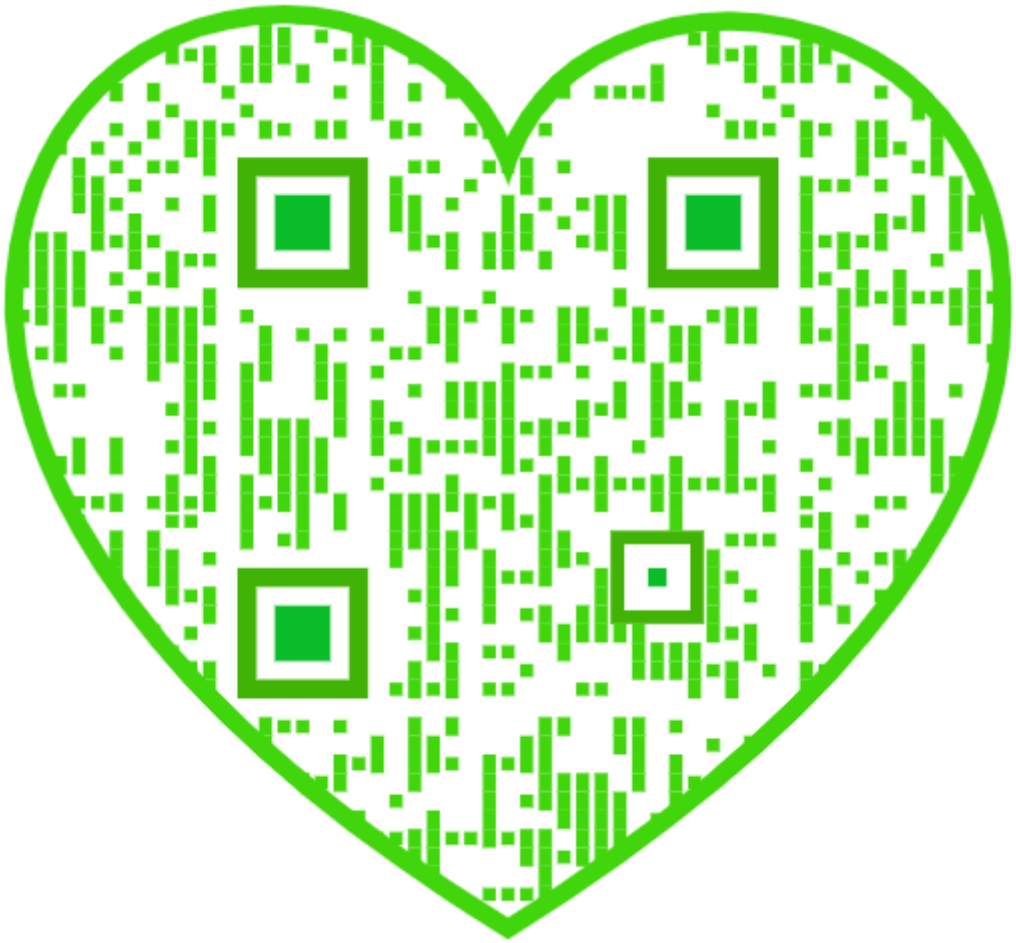

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ALASKA AGRICULTURAL EXPERIMENT STATIONS
SITKA, ALASKA
Under the supervision of the
UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 9

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# THE POTATO IN ALASKA

BY

H. W. ALBERTS
Director

Issued July, 1931

UNITED STATES DEPARTMENT OF AGRICULTURE
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By H. W. ALBERTS, *Director*

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## EXTENT OF POTATO GROWING IN ALASKA

The potato is the most important agricultural crop in Alaska. It is grown mainly for home use in the gardens along the south Alaskan coast, and primarily for the market in the Tanana and Matanuska Valleys in the interior. The crop is produced as far north as Wiseman, about 70 miles within the Arctic Circle, and as far west as Bethel, on the Kuskoquim River.

Stuart (*36, p. 9*)[1] states that the potato found its way from the Western Hemisphere into Europe in 1550. It did not reach Alaska until the close of the eighteenth century, when it was brought in by the Russians who occupied the Territory at that time. During the century following its introduction the crop was grown along the southern coast only. This region is too wet and the topography too rough for successful cultivation of the potato on an extensive scale for the market. With the "gold rush" to the region of Fairbanks in 1903 and 1904, potato growing became an important agricultural enterprise in that region. Following the construction of the Alaska Railroad in 1922 the crop has been grown in the Matanuska Valley for the market.

Probably the greatest handicap to the successful production of the crop is the occurrence of low mean temperatures and of occasional frosts in some places during the summer months. The crop is attacked by some diseases but not to any great extent by insect pests.

[1] Italic numbers in parentheses refer to Literature Cited, p. 17.

## IMPORTANCE OF EARLY MATURING VARIETIES AND SPROUTED SEED

In Alaska, where the growing season is short, only the earliest maturing varieties can be grown successfully, and they must be sprouted before they are planted to assure rapid growth, early maturity, and the production of potatoes of good quality. Stuart (*35, p. 51*) says—

> the practice of greening and germinating seed potatoes before planting them, in order to hasten the development of marketable tubers, is one that is commonly employed by growers of early potatoes in Great Britain and on the Continent * * *.

Georgeson (*18, p. 51*), in an experiment conducted at the Rampart station in 1910, demonstrated the value of sprouting potatoes. Shallow trays of six varieties of potatoes were taken from the house cellar, where they had been wintered, and placed in a well-lighted attic above the living room of the farm cottage. A month later the sprouts ranged from one-half inch on the varieties Gold Coin, Early Ohio, and Irish Cobbler, to 1½ inches on the varieties Extra Early Triumph, Extra Early Pioneer, and Extra Early Eureka. All sprouts were green and strong. Before the potatoes were planted the larger tubers were cut in half lengthwise, and one or more strong sprouts were left on each half. The sections were then planted in the usual manner, care being taken to avoid breaking off the sprouts. However, the sprouts proved to be tough, and the potatoes did not require very careful handling. A row of the same varieties of unsprouted seed was planted the same day alongside each row of sprouted seed. After the seeds were covered the land was leveled in order to prevent loss of moisture from the soil by evaporation. Table 1 gives the results of the experiment.

TABLE 1.—*Effect of sprouting potatoes before planting at the Rampart station.*

| No. | Variety | Hills | Treatment of seed | Date of emergence of plant | Date of blossoming | Yield of potatoes per acre | Increased yield from sprouted seed |
|---|---|---|---|---|---|---|---|
| | | *Number* | | | | *Bushels* | *Per cent* |
| 1 | Gold Coin | 100 | Sprouted | June 7 | July 5 | 210 | 20.7 |
| | | 100 | Not sprouted | June 27 | July 25 | 174 | |
| 2 | Early Ohio | 100 | Sprouted | June 16 | July 16 | 149 | 49.0 |
| | | 100 | Not sprouted | June 27 | July 28 | 100 | |
| 3 | Irish Cobbler | 100 | Sprouted | Jpne 16 | July 15 | 191 | 31.7 |
| | | 100 | Not sprouted | June 24 | July 27 | 145 | |
| 4 | Extra Early Triumph | 80 | Sprouted | June 17 | July 16 | 212 | 71.0 |
| | | 80 | Not sprouted | June 27 | Aug. 1 | 124 | |
| 5 | Extra Early Pioneer | 100 | Sprouted | June 9 | July 7 | 250 | 77.3 |
| | | 100 | Not sprouted | June 27 | July 27 | 141 | |
| 6 | Extra Early Eureka | 65 | Sprouted | June 9 | July 6 | 280 | 68.7 |
| | | 65 | Not sprouted | June 24 | Jyly 25 | 166 | |

The average difference in time of emergence between the plants from sprouted and unsprouted seed was approximately three weeks. The plants were in blossom about four weeks after they emerged. There was a decided gain in every instance in yield of the sprouted seed over the unsprouted seed. The percentage of gain ranged from 20.7 to 77.3.

Smith (*33, p. 222*) states that "potatoes are a cool-weather crop, and undoubtedly originated in the mountains of South America." In these northern latitudes, however, the seed potatoes should be sprouted from two to three weeks before they are planted. After they have been removed from the root cellar and treated for scab control, the seed potatoes should be placed out of doors on the south side of a building in a layer of soil not more than 4 inches deep. During the day the tubers are warmed by the direct rays of the sun, but at night they should be covered with canvas to protect them from frost. Every morning the canvas should be removed. This treatment is continued for a period of two or three weeks. When the short, thick green sprouts are about one-fourth inch long the tubers are ready to be planted. The larger tubers are generally cut in pieces about 1½ inches in diameter, each piece having one to three eyes from which sprouts have grown.

## POTATO GROWING IN DIFFERENT REGIONS OF ALASKA

Because of the great differences in the climatic and economic conditions of the regions in which the potato is grown in Alaska, the subject is treated separately under the three important geographical divisions, viz, southwestern Alaska, southeastern Alaska, and interior Alaska.

### SOUTHWESTERN ALASKA

#### HISTORY

Bancroft (*3, p. 355*) says that the first potatoes in southwestern Alaska were planted in 1795 at Three Saints Bay on Kodiak Island by representatives of Russian fur traders for the use of the white settlers there, and that (*3, p. 227*) the Aleut Indians could not be prevailed upon to eat or cultivate the vegetables, including the potato, planted by the Russians. In 1783 a company of Siberian merchants stationed two ships in Three Saints Bay, fortified their crew against attack by the natives, and took possession of the region for the establishment of headquarters for the fur-trading posts in Russian America, as Alaska was then called. These settlers, 50 in all, planted several gardens with cabbage and potatoes and introduced some cows and goats to add to their comfort. In 1792 the headquarters were moved to Kodiak, where missionaries grew potatoes and turnips successfully.

According to Dall (*8, p. 448*) the Russians claimed, with confirmation by later visitors, that following the introduction of the crop into Alaska, potatoes began to be cultivated in almost every Aleutian village. Quoting Veniamínoff, he (*8, p. 448*) says that from the beginning of the century up to 1837 the crop was raised at the village in False Pass or Isanotski Strait, and seed preserved for planting in the next season.

Brooks and Prindle (*5, p. 216*) are of the opinion that the Cook Inlet natives had been in contact with the whites for more than a century "as the Russians sent their first fur-trading expeditions into this field as early as 1787." Potatoes most likely were grown by the

natives in the region from that time. Brooks, in his preface to the work of Martin et al. (*27*, *p. 15*), believes that the first agricultural colony settled on the east coast of Cook Inlet in 1793. Potatoes and turnips were then grown in the vicinity successfully.

Moser (*28*, *p. 245*) points out that in 1835 the Russian Government issued an order directing the Russian-American Co.—

> to locate, as permanent settlers, such of the employees as had married native or half-breed women and who, on account of age or ill health, could no longer serve the company. The latter, under this order, was obliged to select suitable land, build comfortable dwellings, furnish agricultural implements, seed, cattle and fowls, and a year's provisions.

Many of these people settled on Afognak Island, where potatoes constituted their chief agricultural crop.

Petrof (*30*, *p. 75*) noted that up to 1880 the potato crop was not grown successfully in any part of the Aleutian Islands and that (*30*, *p. 149*) there were about 100 acres of land chiefly in potatoes at Afognak in 1880.

Bancroft (*3*, *p. 687*) records the successful growing of potatoes at Nunilchik in 1880, whereas Petrof (*30*, *p. 150*) reports that in the same year the crop was a complete failure at Kodiak. According to Bancroft (*3*, *p. 682*) potatoes at this time were grown by a missionary on Spruce Island near Kodiak. Georgeson (*14*, *p. 28*) found that potatoes had been grown in 1883 with success on Popoff Island, which is one of the islands in the Aleutian group. He (*13*, *p. 520*) also learned that in 1898 traders and natives grew the crop at the entrance to Cook Inlet. Evans (*11*, *p. 567*) noted that the natives at Kodiak grew potatoes, and Glenn (*24*, *p. 721*) in 1894 found that considerable areas of potatoes were raised at Tyoonik. Brady (*4*, *p. 14*) in 1901 reported that the natives around Karluk formerly raised potatoes but of late years had almost given up the attempt. Evans (*12*, *p. 20*) in 1898 reported that in many places about Kodiak large quantities of kelp were collected and used on the potato crop as fertilizer. The natives and the whites of southwestern Alaska continue to grow the greater part of their potato crop in garden patches just as did their ancestors at the time of the Russian occupation. Such patches are to be found in nearly all the villages.

## SOILS

The soils of southwestern Alaska are generally dark in color, poorly drained, and contain a high percentage of organic matter. The organic matter decomposes very slowly owing to the high moisture content and the low temperature of the soil. Frequent rains wash out the greater part of the soluble soil compounds, leaving little available plant food for the growing crop. In general, the soils are too poor to grow potatoes and must be fertilized for their production. Under the Russian régime barnyard manure, whenever it was available, and also seaweed, were used as fertilizers. Seaweed is just as efficacious as manure and can be obtained in large quantities anywhere along the coast. Wet seaweed when piled in sufficient quantity on planted areas probably warms the soil by fermentation and forces the crop to some extent.

### PLANTING, HARVESTING, AND STORAGE

Evans et al. (*12, p. 20*) advocate the use of the following method of planting: Form the beds 3 or 4 feet wide and raise them as high above the general level as can be economically done. Where the ground is sufficiently level, arrange the beds so as to give the growing plants the greatest amount of light. Beds should extend up and down a hillside.

Georgeson (*21, p. 59*) suggests making the beds as follows: Ditches 1 foot deep and 2 feet wide should be made where it is intended to place the potato rows, and kelp 4 to 6 inches deep should be placed in the ditches and covered with soil. The potatoes should then be planted 8 to 10 inches apart in the soft earth just over the kelp, the pieces being dropped in holes made with a potato spud and covered with soil.

After the beds have been made, planting should be done as follows: The potatoes should be set in rows across the beds. Close planting seems to be the rule, the attempt being to secure the maximum harvest from a lot of seed on a limited area. Potatoes are frequently planted 6 inches apart in rows not more than a foot apart. Close planting is a mistake and results in a heavy vine growth that completely covers the ground and shades it to such an extent as to keep the sun's rays from reaching the soil. Close planting can hardly fail to produce a small crop of inferior tubers.

The method of planting in rows and cultivating common in the States gives the potatoes a better chance to grow and mature than when they are planted close together in the beds. If the seed is planted shallowly and the soil is gradually hilled up around each plant as it grows, the effect of making up the bed is obtained for each hill and row, and the soil in which the plant is growing is well drained and warms up as readily as in the bed.

Georgeson (*20, p. 75*) obtained at Kodiak over 200 bushels per acre of potatoes from a well-drained soil that had been fertilized with barnyard manure.

The crop is dug by hand and is stored in root cellars. Families grow sufficient potatoes for their own use only. Additional supplies are purchased as needed from some tradesman whose stock is shipped in from the States.

### CROP HAZARDS

*Low temperature.*—After the land has been properly prepared and fertilized with seaweed or with barnyard manure, the next factor to be reckoned with in the success or the failure of the potato crop is the temperature, especially during the early part of the growing season. Cool summers with frequent rains and prolonged cloudy weather cause the crop to grow slowly.

*Abnormal behavior and disease.*—Evans (*11, p. 568*) in 1897 reported having seen at Kodiak potato plants that produced numerous tubers in the axils of the lower leaves. Some of these aerial tubers were small, but others were more than an inch in diameter. An intimate connection was thought to exist between the formation of these aerial tubers and the formation of the tubers below ground,

the larger the number of aerial tubers the smaller the number of underground tubers.

Disease may attack the plant and considerably reduce yields. Potato scab, caused by the fungus *Oospora scabies*, has been found attacking some of the crops. Parasitic diseases are likely to be present when the beds are prepared in the same place for several years in succession.

## SOUTHEASTERN ALASKA

### HISTORY

The Indians of southeastern Alaska are said to have had potatoes before the establishment of the Russian settlement at Sitka in 1804. Niblack (*29, p. 277*) records that "many years ago an American ship captain gave the Indians potatoes, and they are now regularly cultivated, and form a considerable item in the winter food supply." Petrof (*30, p. 90*) says that the very first English and American visitors found the natives of southeastern Alaska, especially the Haida tribes, using potatoes. In 1888 Petrof found gardens in all the villages. The principal vegetable in cultivation was the potato, although turnips and a few other vegetables were grown occasionally. The Haida Indians in particular cultivated potatoes in large quantities for use in trading on the mainland.

It is reported that the natives of southeastern Alaska were taught by Americans to make "hoochinoo," or liquor. Niblack (*29. p. 346*) found that the practice of manufacturing hoochinoo flourished among the Thlingits, beginning with the acquisition of Alaska by the United States in 1867. He says that hoochinoo is simply a distillation from potatoes. Bancroft (*3, p. 624*), on the other hand, in his description of the process of manufacturing hoochinoo, does not mention the use of potatoes.

In 1831 (*3, p. 687*) 2,424 pounds of potatoes were raised at Sitka. In 1863 (*8, p. 453*) the official report of the Committee on the Colonies to the Emperor of Russia showed that 170 casks of potatoes were among the annual productions in Alaska. Howard (*25, p. 49*) reported in 1875 that the natives on Admiralty Island planted potatoes like celery is planted in eastern gardens. Jackson (*26, p. 23*) in 1880 learned that potatoes were furnished to Russians by the Kake Indians, and Petrof (*30, p. 149*) reported in 1880 that the only places in southeastern Alaska where potatoes could be raised successfully were at the mouth of the Stikine River near Wrangell and on Prince of Wales Island.

In 1883 Schwatka (*32, p. 331*) found that the natives at Hoonah produced considerable quantities of potatoes. During the Russian occupation the natives around Ahngoon and Kake villages were encouraged to raise potatoes, but in 1901, according to Brady (*4, p. 14*), they had discontinued the industry almost altogether.

In former years when the Indians moved to their summer fishing camps nearly every family had a potato patch. The tubers were planted in the spring and some of the weeding was done by the women. Nearly all these potato patches had a neglected appearance. The land was prepared and fertilized like that in southwestern Alaska.

With the establishment in 1878 of salmon canneries in Alaska (*17, p. 23*), the Indians began to find fishing profitable, which fact probably accounts for their failure to grow potatoes. The men catch the fish, and the women work in the canneries during the summer. Old abandoned potato gardens are still to be seen in many places near the former Indian fishing camps. The Indians who live at remote distances from steamship ports still grow potatoes and vegetables. Many of their gardens are to be found at Hoonah and at Killisnoo.

Small quantities of potatoes are grown by white men for the market at Juneau, Gustavus, Haines, Skagway, and on the Stikine flats near Wrangell, but the greater part of the potatoes consumed in southeastern Alaska are shipped in from Seattle.

## SOILS

The soils in southeastern Alaska contain a high percentage of undecomposed organic matter the soluble nutrients of which have been washed out by almost continuous rains. Such soils must be fertilized before they can be expected to produce a crop. Owing to the frequent rains in this region seaweed can be more efficiently used as a fertilizer than fish guano (*16 p. 248*).

## PLANTING, CULTIVATING, AND HARVESTING

In southeastern Alaska the tubers are planted about the last week in May. They should be planted so that the tips will lie immediately below the warm surface of the soil. Several cultivations may be necessary to check weed growth. When the potato plants are about 8 inches high they should be hilled up, and about 10 days later the hilling process should be repeated. They need not receive further cultivation. The crop is dug by hand about the first week in October. Yields exceeding 200 bushels per acre have been obtained in favorable seasons on good soils.

## VARIETIES

A number of seedling varieties of potatoes have been produced at the Sitka station. Varieties making yields of good marketable potatoes have been selected and retained for further trial, whereas those not conforming to the standard in size, quality, flavor, and yield have been discarded. Some of the best varieties have been distributed among the settlers mainly in southeastern Alaska. A number of the settlers in southeastern Alaska obtained their original potato seed stock from the station.

## CROP HAZARDS

*Low temperature.*—Unfavorable growing weather is the greatest hazard to the crop. Continued cool weather hinders development of the tubers and retards maturity. Immature potatoes when cooked are soggy.

*Disease.*—Probably the most prevalent disease is potato scab. Georgeson (*17, p. 39*) found a fungus attacking the vine at the ground and working downward to the tubers, causing them to rot.

## INTERIOR ALASKA

### HISTORY

Dall (*8, p. 438*) reported in 1870 that the few Russian settlements in the Yukon territory, pursuant with the charter of the Russian-American Co. enjoining them to "promote agriculture," were formerly provided with small gardens, but little interest was taken by the officers of the company in such matters, and no gardens were cultivated except those belonging to missionaries. These men received no assistance from the company. Dall (*8, p. 442*) says that potatoes succeeded at Fort Yukon, though the tubers were small. They were regularly planted for several years until the seed was lost by freezing during the winter. At St. Michael they did not do well.

In 1886 a Roman Catholic mission was established at Holy Cross on the Yukon River. Georgeson (*13, p. 520*) in 1898 reported that the yield of potatoes at this place was 189 bushels per acre.

Eldridge (*10, p. 24*) in 1898 found the agents of the Alaska Commercial Co. and the Indians annually raising excellent potatoes of moderate size at the Susitna station, just below the mouth of the Yentna.

Abercrombie (*1, p. 580*) in 1898 found that potatoes were planted in the Copper River region. Frosts occur in midsummer in this part of the Territory and prevent the profitable production of the crop.

Georgeson (*15, p. 61*) in 1900 found good potatoes growing in garden patches at Weare and at Fort Gibbon on the Yukon River.

Potatoes have been produced in gardens at Coldfoot, Wiseman, and Bethel. Missionaries and secular teachers have planted the crop in these isolated regions with partial success.

Potatoes grown in the Copper River region by the experiment station during the period 1905–1908 were killed by frost August 14, 1905; May 31, July 16, and August 8, 1906; August 1 and August 24, 1907; and July 31 and August 4, 1908.

Prindle (*31, p. 29*) says that the location of a trading post at Fairbanks in the Tanana Valley in 1901 was followed in 1902 by the discovery of gold. The region began to attract attention and by the end of 1903 had become of prospective importance. Potato growing for the market in the Tanana Valley very probably had its beginning soon after the gold rush to the region of Fairbanks.

Edes (*9, p. 190*) in 1915 found that homesteaders began to be attracted to the Matanuska-Susitna region about the time the town lots at Anchorage were sold by auction. The potato was the only readily salable crop in the region. The first potatoes were brought into the region on horseback over the trail from Knik.

### TANANA VALLEY

The conditions under which the potato is grown in the Tanana Valley differ from those in the Matanuska and Susitna Valleys. These two regions will therefore be treated separately.

### CLIMATE

The mean temperature in the Tanana Valley from May to September, inclusive, for the 10-year period 1918–1929 was 52° F., as in

the Matanuska Valley. In July the mean temperature was nearly 60°, which is somewhat higher than the midsummer temperature in the Matanuska region. The temperature for growing potatoes in the Matanuska and Susitna and the Tanana Valleys differs slightly. The warmer air temperature of July in the Tanana Valley is offset by the cooler soil temperature. The rainfall also is light in this region. The mean precipitation for the 10-year period was 0.6 inch for May; 1.2 inches for June; 1.7 inches for July; 1.1 inches for August; and 1.7 inches for September. The rainfall varies widely from year to year, and droughts sometimes occur, whereas at other times there is an excessive amount of moisture for the potato crop.

### SOILS

The upland loam soils of the region are best adapted to potato culture. The crop responds most favorably to cultivation when grown on south-slope land. The vines usually are killed by frost from two to three weeks earlier on flat lands than on hillsides. The south-slope lands are subject to drought, but they yield better crops than the north-slope lands most of the subsoil of which is perpetually frozen. There is little bacterial action during the greater part of the year in the north-slope lands because of the low prevailing temperatures. These soils are generally low in natural fertility but respond satisfactorily to treatment with fertilizers containing readily available plant nutrients. Crop rotation is practiced mainly for the purpose of controlling weeds and diseases. Little livestock is raised in the region, and barnyard manure in consequence is not available for use as a fertilizer on an extensive scale.

### FALL PLOWING

Fall plowing is preferable to spring plowing and should be done sufficiently early to complete the operation before the ground freezes. In some years the temperature drops suddenly in the fall, and the soil is frozen to such an extent as to prohibit plowing until the following spring.

### COMMERCIAL FERTILIZERS

Georgeson (*22, p. 29*) in 1921 applied commercial fertilizers to the potato crop at the Fairbanks station and obtained an average increase in yield of 36 per cent over unfertilized potatoes. The rows were treated with a 2:6:4 fertilizer combination (nitrogen, phosphorus, and potash) at the rate of 400 pounds per acre. Growers who produce potatoes for the market use liberal quantities of commercial fertilizer on the crop.

### PLANTING AND CULTIVATING

Planting in this region during a period of over 20 years has been done from May 15 to June 5. The crop is commonly planted during the last week of May. According to Georgeson (*18, p. 58*) the tubers should be planted near the surface of soils of a clayey nature, and the ground should be ridged slightly to cover the seed. Ridging should be continued with each cultivation until sufficiently done to

protect the tubers from a light fall freeze that may occur before the crop is harvested.

Georgeson (*19, p. 32*) in 1913 found that ridging is not so essential on south-slope lands and that level culture produces the best results when there is a drought. Ridged land dries out faster than level land, and growth is checked when the season is dry.

When level culture is practiced, the ground should be harrowed soon after planting is done and again after the plants begin to emerge. The field should be cultivated two or three times during the season, the number of times depending upon the presence of weeds. On comparatively level land the rows should be ridged when the plants are about 6 inches high and again just before they

FIGURE 1.—Digging potatoes near Fairbanks

blossom. Only the earliest varieties should be grown. Some of the more common varieties that succeed are the Irish Cobbler and the American Wonder.

### HARVESTING, STORAGE, AND YIELDS

Harvesting may be done from September 8 to September 25 and usually is done between September 10 and 15. (Fig. 1.) After this period the temperature is likely to drop and cause the ground to freeze to a depth of an inch or more. The crop should be harvested even if the vines show no signs of maturity. Usually the vines are killed by a light frost occurring before harvest time.

Potatoes are dug by hand or by machine. They are gathered into sacks or into crates and taken to the root cellar. Crates are prefer-

able to sacks because the skin of the tuber is soft and easily injured. The root cellar should be made in the side of a hill and equipped with ventilated bins. (Fig. 2.) Sometimes the temperature in the cellar drops gradually to about 32° F. If it remains low for a considerable period the tubers when cooked will be found to have a decidedly sweetish taste. Stuart (*34, p. 6*) states that such tubers lose about four-fifths of the sugar accumulated when they are exposed to a temperature of 70° to 75° for a week.

The average yields per acre obtained annually at the Fairbanks station were 126 bushels in 1910, 228 bushels in 1911, 235 bushels in 1912, 100 bushels in 1913, 150 bushels in 1914, 171 bushels in 1915, 133 bushels in 1917, 51 bushels in 1918, 75 bushels in 1921, 137 bushels in 1927, 85 bushels in 1928, and 204 bushels in 1929. For the last

FIGURE 2.—A farmer's potato cellar

15 years the crop has averaged 156 bushels per acre. The chief factors which affect yield in this region are temperature, soil fertility, midsummer frosts, and drought.

### CROP HAZARDS

*Frost.*—The chief crop hazard in the Tanana Valley is the occasional occurrence of midsummer frosts which kill the potato vines. Early killing frosts which materially reduced yields and in some instances caused almost total crop failures occurred August 31, 1908, August 25, 1909, July 29, 1910, June 29, 1918, August 26, 1918, and July 22, 1928. On September 8, 9, and 10, 1908, the ground froze to a depth of 1 inch, and many acres of potatoes were destroyed. In 1918 the potato crop was almost a complete failure. Only a few fields on upland areas escaped the killing frosts. The soil remained cool for a long time in the spring, and plants that had not

emerged by June 29 were killed August 26. Some of the seed tubers remained in the ground for four weeks before the plants began to emerge. In 1919 the ground was also so cool in the spring that the plants did not emerge before the middle of July.

*Drought.*—The rainfall early in the season in the Tanana Valley is generally very light, and crops sometimes suffer from drought. In 1917 the crop suffered severely for the want of moisture on land that had been under cultivation for several years.

*Disease.*—Tubers that are not treated with formaldehyde solution before planting are likely to be severely attacked by scab. In 1917 the crop was severely attacked by scab and by blight. In 1924 a scabby crop was had as the result of planting on manured land, whereas a clean crop was produced on areas to which commercial fertilizers had been applied.

#### PRODUCTION AND PRICES

The total production in the Tanana Valley is estimated at 300 tons for 1912, 800 tons for 1914, 900 tons for 1915, and 550 tons for 1918.[2] In 1911 approximately only 25 per cent of the potato crop consumed in the Tanana Valley was grown locally. The rest was shipped in from Seattle via Skagway over the White Pass & Yukon Railroad and the Yukon and Tanana Rivers, or via St. Michael up the Yukon and the Tanana Rivers. In 1914 the area in the crop was extended, and the local market was glutted with home-grown and introduced potatoes. They retailed at the very low price of 4 cents per pound. In 1915 the local production was greater than the local consumption, and since then potatoes have been produced annually in sufficient quantities in favorable seasons to supply local demand. In unfavorable years local production is supplemented by shipments of potatoes from the States.

In the early days the price paid for potatoes was high at Fairbanks. Nearly every grower sold his potatoes directly to the consumer. Little attention was paid to grading potatoes according to United States official standards (*38, p. 21*) with the result that the locally grown product soon fell into disfavor. Within recent years the growers have been grading their potatoes more carefully than formerly. The market value of potatoes was 20 cents per pound in 1907, 9 cents in 1910, 6 cents in 1911, 4 cents in 1914, 6 cents in 1916, 6 cents in 1917, 5 cents in 1921, and 5 cents in 1928. In 1912 the Tanana Valley Farmers' Association was organized, among other things, to collect information on production and consumption of potatoes in the region of Fairbanks in order to regulate the area planted in the crop.

### MATANUSKA AND SUSITNA VALLEYS

#### CLIMATE

The summers in the Matanuska and Susitna Valleys are cool. During the five growing months of May to September, inclusive, the mean temperature for the 10-year period 1919–1928 was approximately 52° F. In July the mean temperature for the period was

[2] Figures for other years than those mentioned have not been obtained.

55°. The rainfall is light. During May the mean is less than 0.5 inch. In June the rainfall is 1 inch; in July, 1.7 inches; in August, 2.5 inches; and in September, 2.6 inches. Although the rainfall during the early growing season is comparatively low there is ample moisture for early growth from the melting snows of the previous winter. Cloudy and calm days are frequent and lessen the amount and rate of evaporation. Moisture is not, therefore, the limiting climatic factor in potato growing. The temperature of the season determines the relative success of the crop. When the spring is cool the plants make little progress, and when the temperature is low in the fall the tubers remain immature.

### SOILS

The best crops of potatoes in these regions are produced on a sandy loam soil along the Matanuska River. This type of soil warms up comparatively early in the spring and enables the plants to get an early start. Another good soil is the Knik loam which is underlain with gravel. This kind of soil should be rich to a depth of at least 4 feet so that it will readily retain moisture early in the season. The use of low, flat land should be avoided. On such lands the potato grows slowly early in the season, and the plants are killed by frost in the fall before the crop has had a chance to mature. The lowland soils are subject to killing frosts in midsummer and from two to four weeks earlier in the fall than the upland soils. Potatoes of poor quality are obtained on land that has not been subdued and on land that has been recently burned over. The high potash content of such soils enables the tubers to grow but retards maturity in the fall.

In the absence of commercial fertilizers, soil fertility can be maintained only by the application of barnyard manure, when that can be had, and by the practice of a systematic rotation in which leguminous crops, especially the vetch, play an important part.

### PLOWING

The fields are either fall plowed or spring plowed, depending upon the length of time the farmer has to complete his plowing in the fall. In these regions little difference in yield has been observed between fall-plowed and spring-plowed land. Fall plowing is preferable because the land can be made ready for planting sooner than would otherwise be the case.

### COMMERCIAL FERTILIZERS

Georgeson (*23, p. 16*) in an experiment at the Matanuska station in 1925 demonstrated the value of commercial fertilizers for potatoes. The varieties White Triumph (White Bliss) and Green Mountain were planted 3 feet 8 inches apart in rows extending north and south and fertilized with a mixture of tankage (75 per cent) and sodium nitrate (25 per cent), applied at the rate of 400 pounds per acre before cultivation when the seedlings were 4 inches above the surface of the ground. Four rows were treated, alternating with four rows that were left untreated across the plat. Direct comparisons of the

fertilized and unfertilized areas showed that the former yielded 61 bushels more per acre of the Green Mountain and 23 bushels more per acre of the Triumph (White Bliss) than did the unfertilized area in these varieties.

### TREATING, SPROUTING, AND CUTTING SEED

About two or three weeks before the seed tubers are planted they should be treated with a formaldehyde solution (1 pint of 40 per cent formalin to 30 gallons of water) for one and one-half to two hours for scab control. The tubers should then be removed from the bath and sprouted. The common practice is to sprout them from two to three weeks before planting. This is done by putting the tubers in the sunlight on the south side of a building in a layer of

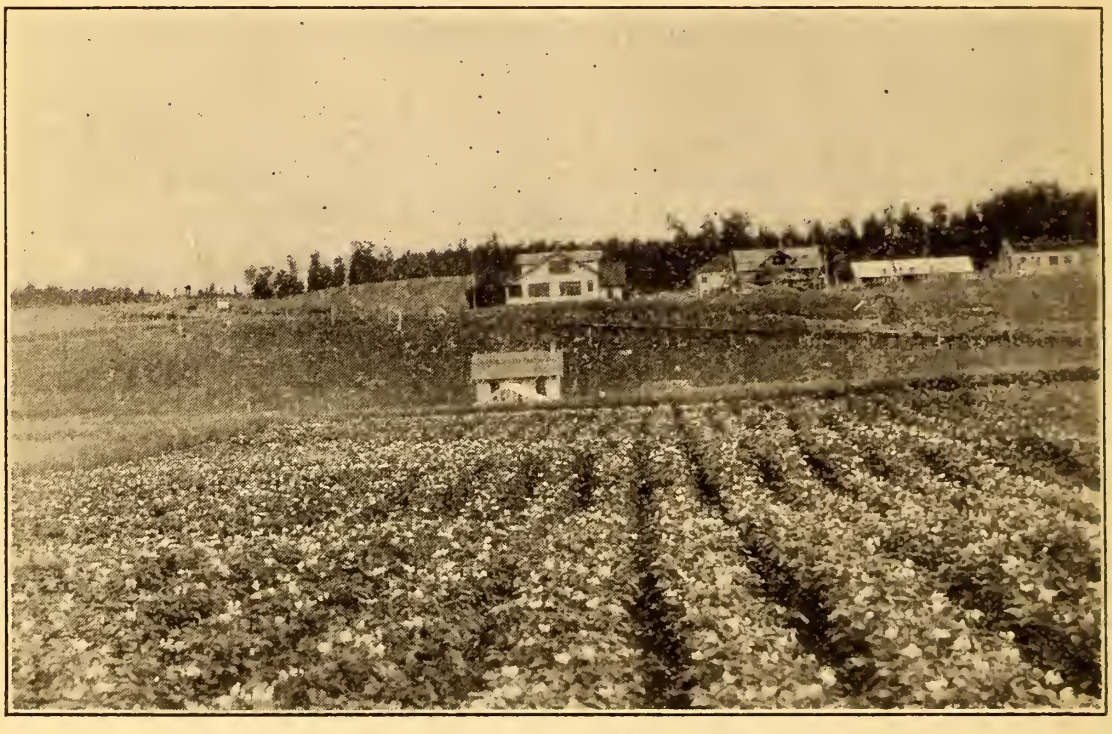

FIGURE 3.—Potato field, Matanuska experiment station

soil about 4 inches deep. The soil should be covered with canvas at night. As soon as the fields are ready for use the large tubers should be cut in pieces about 1½ inches in diameter. Each piece should have one to three eyes. The proper length of sprout for planting is a disputed question. Stuart (*37, p. 37*) in studies covering several years on sizes of potato sets obtained rather conflicting results so far as the yield of marketable potatoes is concerned. The tubers should be cut just before they are planted.

### PLANTING AND CULTIVATING

In these regions potatoes are planted usually from May 15 to May 25, depending upon weather conditions in the spring. (Fig. 3.) In comparatively warm springs the crop has been planted as early as April 28, and in retarded seasons planting has had to be delayed until June 1. A small area of land may be planted by hand, but 5 or more acres will require the use of horse-drawn machines for

planting. The potatoes should be planted 15 inches apart in rows usually 3½ feet apart. When planting is to be done by hand the land should be marked off and furrows about 5 inches deep dug with a horse-drawn cultivator from which all the shovels have been removed except the rear center shovel. The seed pieces should be dropped in place and set firmly in the ground. The furrows should then be closed with the shovel cultivator, making a furrow on each side of the row.

When a hand potato planter is used the rows should be marked at right angles across the field and the tubers planted at the intersection of the marks. For large areas horse-drawn planters, similar to those employed in the potato regions of the States, should be used. The field should be harrowed shortly after planting is done. A second harrowing should be given as soon as about 50 per cent of the plants emerge. Harrowing destroys weed seedlings.

Two cultivations should be given during the summer. The second cultivation is made before the vines spread into the spaces between the rows, and usually before the potatoes are in full bloom. At this time the soil is thrown against the plants with the large lateral shovels of the cultivator.

*Weeds.*—Lamb's-quarters and chickweed are troublesome in potato fields. Lamb's-quarters appears early in the season and establishes itself in the rows of fields that were not properly tilled and harrowed after the plants emerged. The spaces between the rows should be kept free from weed growth by the use of the cultivator. Chickweed is often very troublesome in the fall. It takes possession of the field after the vines have begun to spread, especially when the ground is kept moist by drizzling rains. The practice of clean cultivation earlier in the season will materially suppress weed growth.

### HARVESTING, STORAGE, AND YIELDS

The potato vines turn only slightly yellow in the fall. Usually they are killed by a light frost one or more weeks before harvesting time. According to Clark (*6, p. 26*) a small increase in weight of tubers occurs after the vines have been killed by frost. The crop is harvested from September 15 to October 5. Most of the crop is harvested by the last week in September. The potatoes are dug by hand or by digger and are placed in crates or in sacks. The crop is stored temporarily in root cellars and later hauled to the railroad station for shipment to the market.

At the Matanuska station the average yield of potatoes was 166 bushels in 1920, 283 bushels in 1921, 210 bushels in 1924, 205 bushels in 1925, 201 bushels in 1926, 169 bushels in 1927, 138 bushels in 1928, and 162 bushels in 1929. The average yield for the years reported is 191 bushels per acre.

### VARIETIES

The varieties most commonly grown in these regions are Irish Cobbler, White Bliss, Bliss Triumph, Early Ohio, Idaho Rural, and Matanuska. Only varieties that mature early should be grown, because the growing season is short and cool. A number of seedling varieties originating at the Sitka station have been found to mature

early and to give high yields, but they have not as yet been grown commercially. The variety Matanuska has been grown in these regions since 1912. The seed tubers of the variety were shipped in from San Francisco and planted at Knik.

### CROP HAZARDS

*Frost.*—The greatest crop hazard in the Matanuska and Susitna Valleys is the occurrence of frost in the early fall before the tubers mature. Sometimes the crop must be harvested long before the starch grains in the tubers fully develop. Such tubers are soggy, sweetish, and easily shed the skin when slightly bruised and even under ordinary handling in placing them in crates or in sacks. They discolor when cooked and are very undesirable for market purposes.

*Drought.*—Growth is retarded when the early summer months are cool and dry, as occasionally happens. With the beginning of the rainy season about the middle of August the plants make rapid growth, although they may not be mature at harvest time.

*Disease.*—The most prevalent diseases of the potato in these regions are scab, blight, and Rhizoctonia. Scab is found in fields in which potatoes have been planted for several years in succession. It can be controlled by soaking the tubers before planting for one and one-half to two hours in a formaldehyde solution (1 pint to 30 gallons of water). Occasionally blight attacks more than 40 per cent of the plants and reduces yield. Rhizoctonia is present in the fields nearly every year, but it is less virulent in some years than in others.

### PRODUCTION AND PRICES

Potato production in the Matanuska and Susitna Valleys became an important agricultural enterprise during the period the Alaska Railroad was under construction in 1922. This railroad traverses the valleys.

In 1917 the farmers banded together with the expectation that they would pool their crops of potatoes in order to get the price they asked for them. They believed that they should receive the wholesale price prevailing at Seattle plus freight charges from Seattle and distribution charges. Local buyers found that potatoes could be purchased from the States at a lower price and shipped in the quantities they needed. In consequence there was no market in the spring of 1918 for the locally grown crop, and the farmers disbanded and many of them abandoned potato growing. In 1920 the estimated total production for the regions was 450 tons. The market value of the crop was 3½ cents per pound in 1920 and 2½ cents per pound in 1928.

Potatoes of fine quality are produced in the Matanuska and Susitna regions on well-drained land that has been under cultivation for several years. No difficulty is experienced in marketing the crop when the tubers are mature and are properly graded according to market requirements. Cull potatoes sometimes have been wasted for lack of livestock to which to feed them. In recent years dairying has developed in these regions and cull potatoes are fed in limited quantities to the cattle and hogs. Babcock (*2, p. 12*) says that potatoes fed in small quantities immediately after the cows are milked do not affect the flavor or the odor of the milk.

## SUMMARY

Potatoes were introduced into Alaska by the Russians and were grown in small quantity mainly along the southern coast.

After the gold rush to interior Alaska the potato became an important crop in the region near Fairbanks.

Potatoes have become an important crop in the Matanuska Valley since the Alaska Railroad opened this fertile region for agricultural settlement.

The south coast of Alaska is too wet and the topography too rough to permit extensive production of potatoes for the market.

The Tanana Valley and the Matanuska and Susitna Valleys are adapted for growing potatoes for the market.

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